

List of Figures

Figure.....	Page
1. Proposed Conceptual Architecture for Knowledge-based Generation of Concurrent Designs for Real-Time Software.....	55
2. Decomposition of the Design-Process Meta-Knowledge and Related Knowledge Bases.....	60
3. General Organization of Knowledge within a Decision-Making Knowledge Base.....	68
4. An Algorithm Representing the Cyclic Execution Model Controlling Each Decision-Making Process.....	72
5. Syntactic Elements for Composing RTSA Data/Control Flow Diagrams.....	77
6. First-Level Division of Concepts.....	79
7. Specialization of Specification Elements to RTSA Syntactic Elements.....	81
8. The Terminator Classification Hierarchy.....	84
9. The Solid Transformation Classification Hierarchy.....	85
10. The Device Interface Object Classification Hierarchy.....	87
11. The Dashed Transformation Classification Hierarchy.....	89
12. The Solid Directed Arc Classification Hierarchy.....	89

13. The Dashed Directed Arc Classification Hierarchy.....	91
14. The Function Classification Hierarchy.....	94
15. The Solid Two-Way Arc Classification Heirarchy.....	97
16. The Specification Addenda Classification Hierarchy.....	98
17. The Concept Hierarchy, Axioms, and Inheritance.....	103
18. A Four-Stage Inference Network for Classifying Concepts.....	108
19. A Diagrammatic Notation for Representing Selected Entities from the Design Meta-Model.....	114
20. A Diagrammatic Notation for Representing Selected Relationships from the Design Meta-Model (Part One of Three).....	116
21. A Diagrammatic Notation for Representing Selected Relationships from the Design Meta-Model (Part Two of Three).....	118
22. A Diagrammatic Notation for Representing Selected Relationships from the Design Meta-Model (Part Three of Three).....	120
23. An Entity-Relationship Diagram Depicting the Design Meta-Model (Part One of Two).....	125
24. An Entity-Relationship Diagram Depicting the Design Meta-Model (Part Two of Two).....	131
25. Organization of Task Structuring Knowledge.....	142
26. Organization of Task Interface Definition Knowledge.....	182
27. Organization of Module Structuring Knowledge.....	226

28. Organization of Task and Module Integration Knowledge.....	279
29. Software Architecture for Prototype COncurrent Designer's Assistant.....	306
30. CODA Startup Dialog.....	320
31. CODA Commands Available to an Experienced Designer.....	323
32. Attempt to Analyze a Specification Before Loading a Specification.....	324
33. CODA Queries Provided for an Experienced Designer.....	328
34. Annotated Context Diagram for Automobile Cruise Control and Monitoring System.....	457
35. State-Transition Diagram for Cruise Control.....	461
36. Subsystem Decomposition of Automobile Cruise Control and Monitoring.....	463
37. Decomposition of the Automobile Cruise Control Subsystem.....	465
38. Decomposition of Automobile Control.....	466
39. Decomposition of Speed Control.....	468
40. Decomposition of Distance and Speed Measurement.....	470
41. Decomposition of Calibration.....	472
42. Decomposition of the Automobile Monitoring Subsystem.....	473
43. Decomposition of Average Mileage.....	474
44. Decomposition of Maintenance.....	476
45. Task Behavior Specification for Perform Calibration.....	497
46. Module Specification for Calibration.....	498

47. Automobile Cruise Control and Monitoring System Design (Part One of Two).....	500
48. Automobile Cruise Control and Monitoring System Design (Part Two of Two).....	501
49. Cruise Control Subsystem Design - Novice Designer.....	506
50. Monitoring Subsystem Design - Novice Designer.....	507
51. Annotated Context Diagram for Robot Controller System.....	510
52. Initial Decomposition of the Robot Controller System.....	514
53. Decomposition of Process Robot Command.....	515
54. State-Transition Diagram for Robot Controller.....	517
55. Generated Design for Robot Controller - Default Target Environment.....	525
56. Generated Design for Robot Controller - Target Environment Provides No Message Queues.....	528
57. A Modified Data/Control Flow Diagram for the Robot Controller.....	530
58. Generated Design for Robot Controller System, Version 2 - Default Target Environment.....	531
59. Context Diagram for an Elevator Control System.....	535
60. State-Transition Diagram for the Elevator Controller.....	538
61. Subsystem Decomposition of the Elevator Control System.....	539
62. Decomposition of the Elevator Subsystem.....	540
63. Decomposition of Elevator Control and Management.....	541

64. Decomposition of the Floor Subsystem.....	542
65. Design Summary and Completeness and Consistency Report (Part One of Two).....	547
66. Design Summary and Completeness and Consistency Report (Part Two of Two).....	548
67. Generated Design for the Elevator Control System - Default Target Environment - No Messages Assigned Priority.....	549
68. Design for the Elevator Control System - Default Target Environment - Queued Messages Assigned Varying Priorities.....	554
69. Design for the Elevator Control System - Priority Message Queues Available - Queued Messages Assigned Varying Priorities.....	556
70. Design for the Elevator Control System - Default Target Environment - Large Building (12 Elevators and 48 Floors).....	557
71. Original RTS Data Flow Diagram as Analyzed by CODA.....	561
72. Amended RTS Data Flow Diagram as Analyzed by CODA.....	565
73. Task Architecture for the Remote Temperature Sensor Design.....	572
74. The Completed Design for the Remote Temperature Sensor.....	575
75. Design Generated, Unaided, by CODA for the Remote Temperature Sensor.....	578